The role of fluids in promoting seismicity in active spreading centers of the Salton Trough, California

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We interpret seismic activity in the active spreading centers of the Salton Trough at the Brawly, Cerro Prieto, Imperial and San Jacinto faults to indicate 1) a magmatic body in the lower crust that lies beneath these active faults and 2) fluids in the upper crust that have been released from that magmatic body. The absence of a magmatic body and fluids at the location of fossil spreading centers along the Sand Hill and Algodones faults is consistent with the weak or absent seismic activity in those areas. We show several lines of evidence to indicate that melt and fluids are related to the seismic activity. In particular, receiver functions analysis, and tomographic data reveal high $V_p/V_s$ ratios. Low velocity zones coincide with the location of the active spreading centers. High $V_p/V_s$ ratios and low velocity zones in the lower crust and upper mantle are attributed to melt inclusion, while low $V_p/V_s$ ratios in the upper crust are caused by the inclusion of H$_2$O. Frequency-magnitude distributions, “b-values”, are high in southern California; high “b-values” have also been associated with fluids. A crustal scale model created from the receiver functions, gravity, and magnetic data support the existence of a magmatic body at a depth of about 20 km to the southwest of Salton Sea. That body extends for 90 km in SW-NE direction.